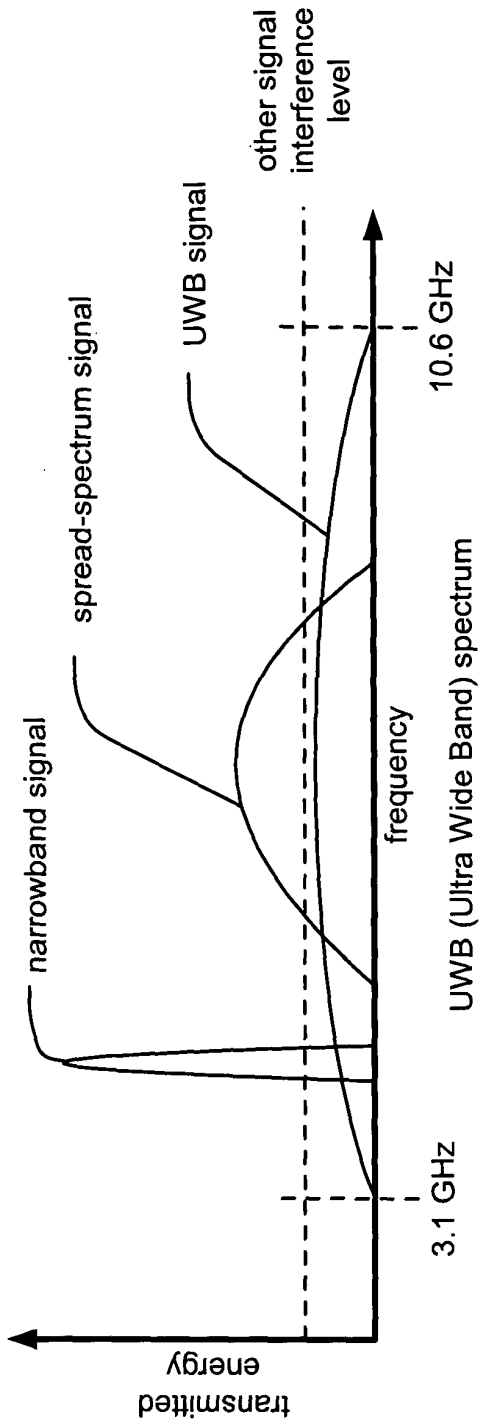

transmitted energy
narrowband signal
spread-spectrum signal
UWB signal
other signal interference level
3.1 GHz
10.6 GHz
frequency
UWB (Ultra Wide Band) spectrum

Fig. 1A

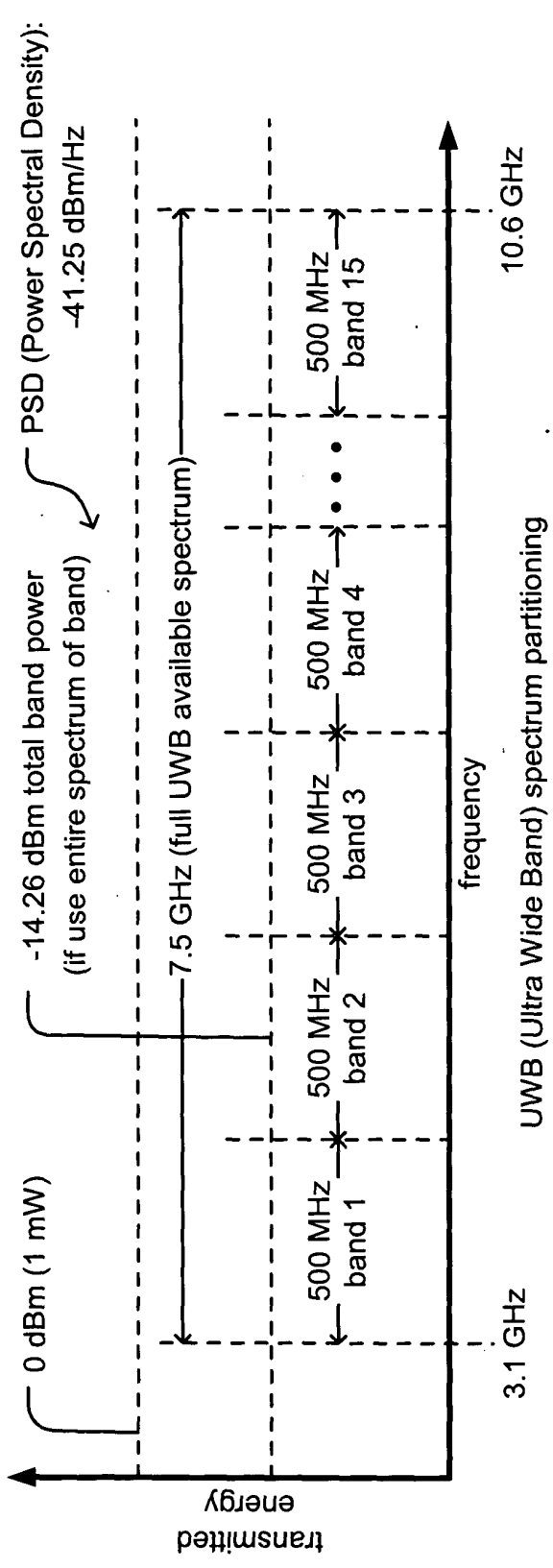
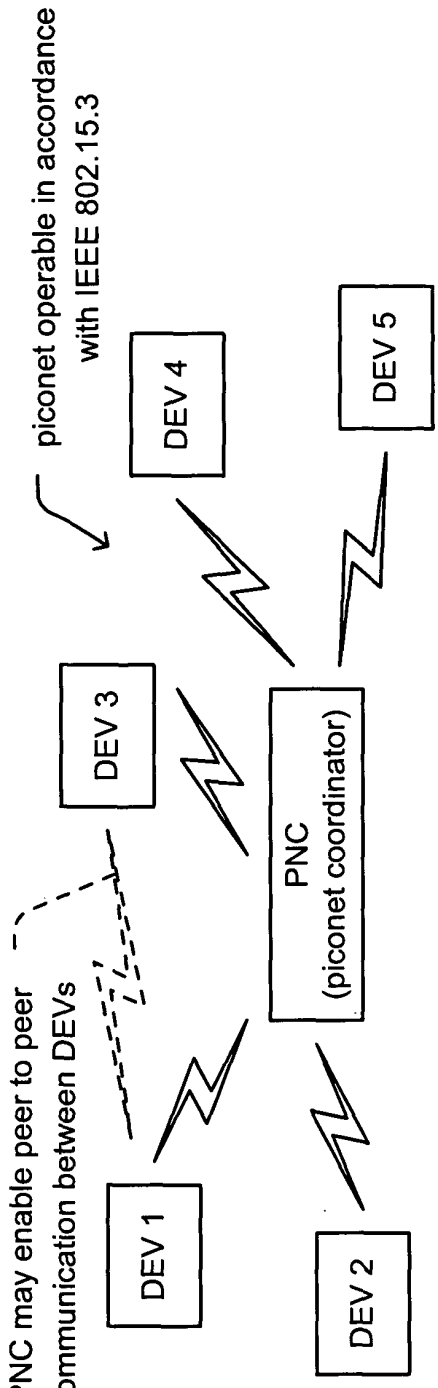
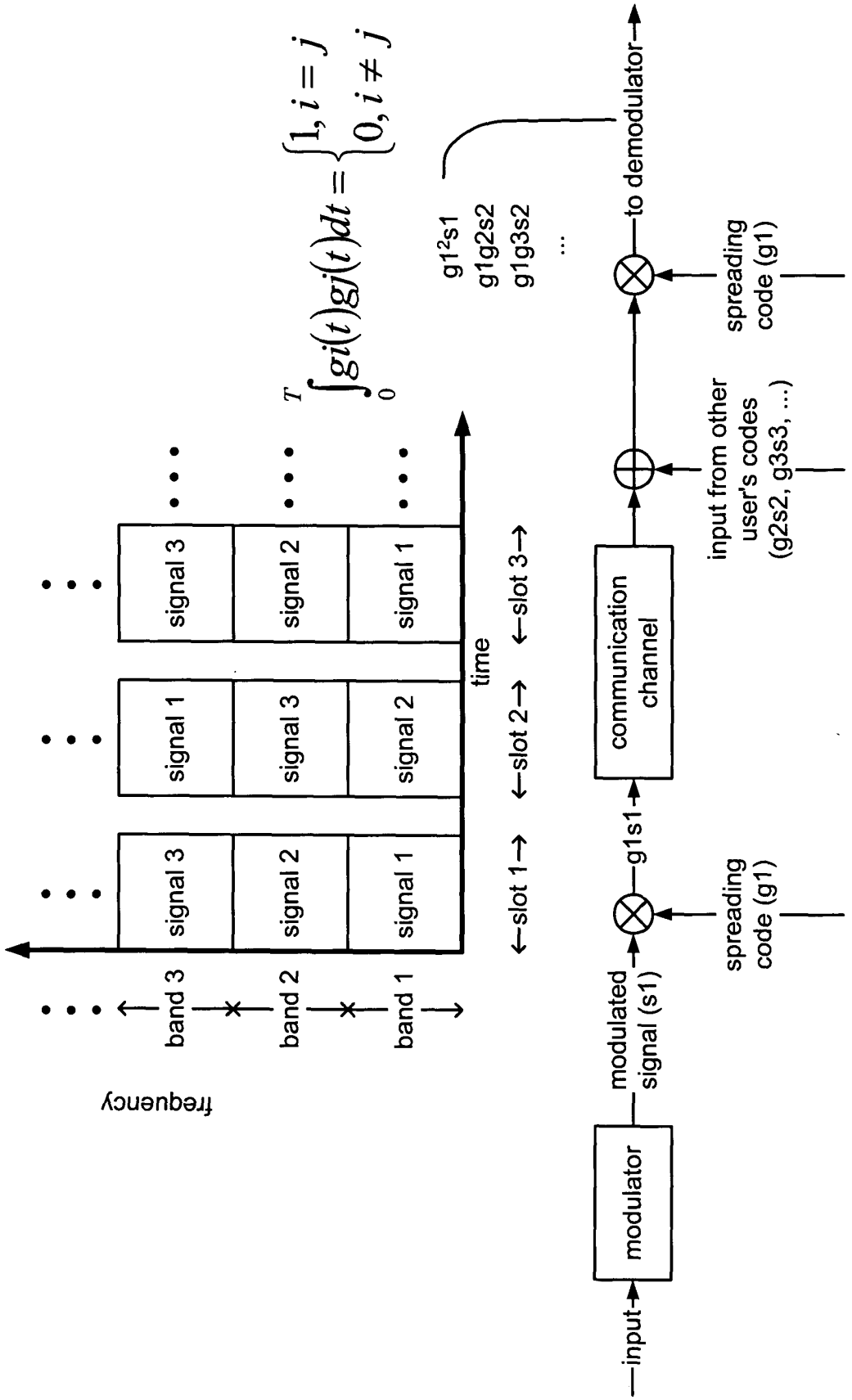

transmitted energy
0 dBm (1 mW)
-14.26 dBm total band power (if use entire spectrum of band)
PSD (Power Spectral Density): -41.25 dBm/Hz
7.5 GHz (full UWB available spectrum)
500 MHz band 1
500 MHz band 2
500 MHz band 3
500 MHz band 4
500 MHz band 15
3.1 GHz
10.6 GHz
frequency
UWB (Ultra Wide Band) spectrum partitioning

Fig. 1B



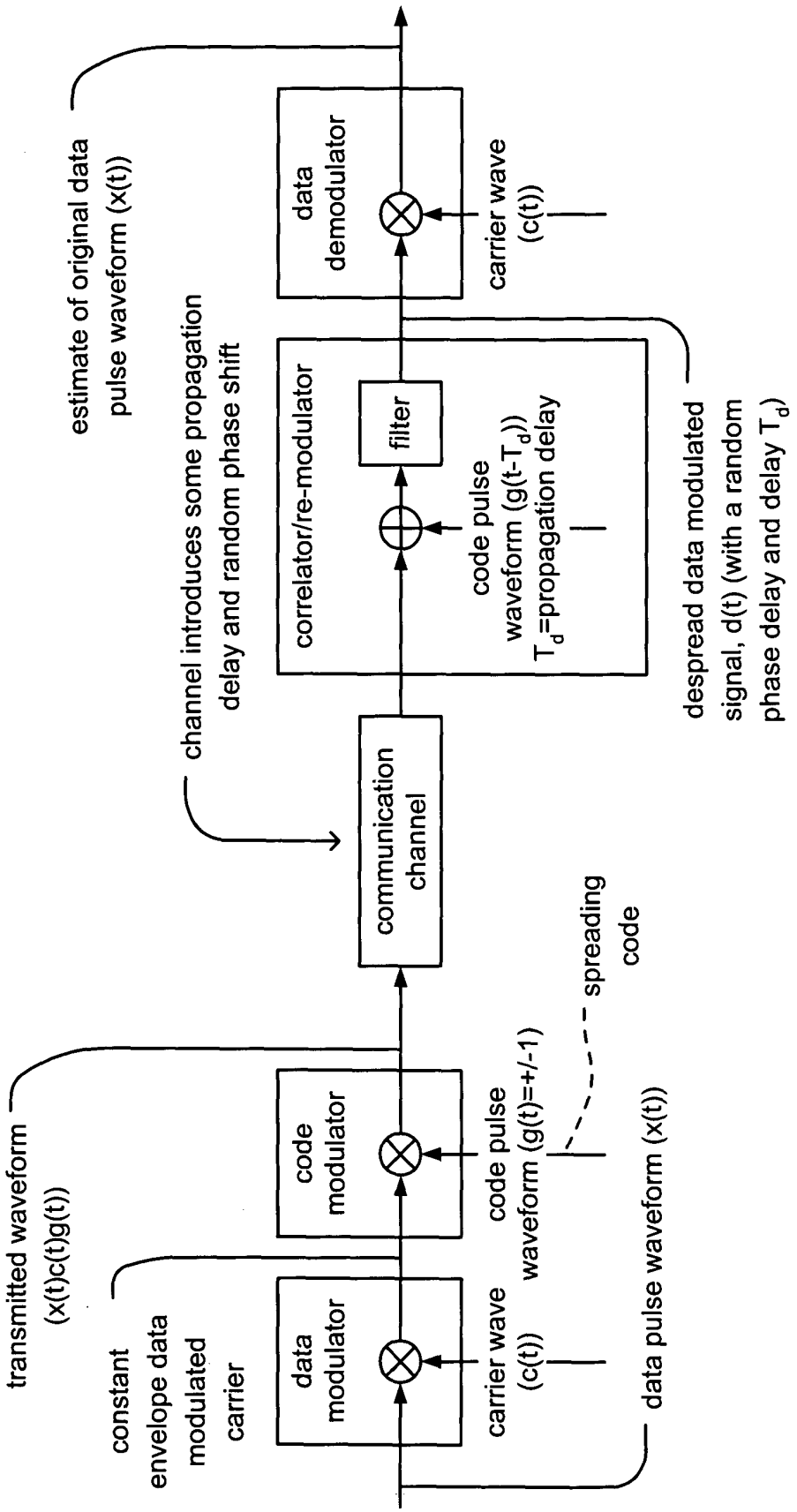
piconet (shown in wireless communication system embodiment)

Fig. 2



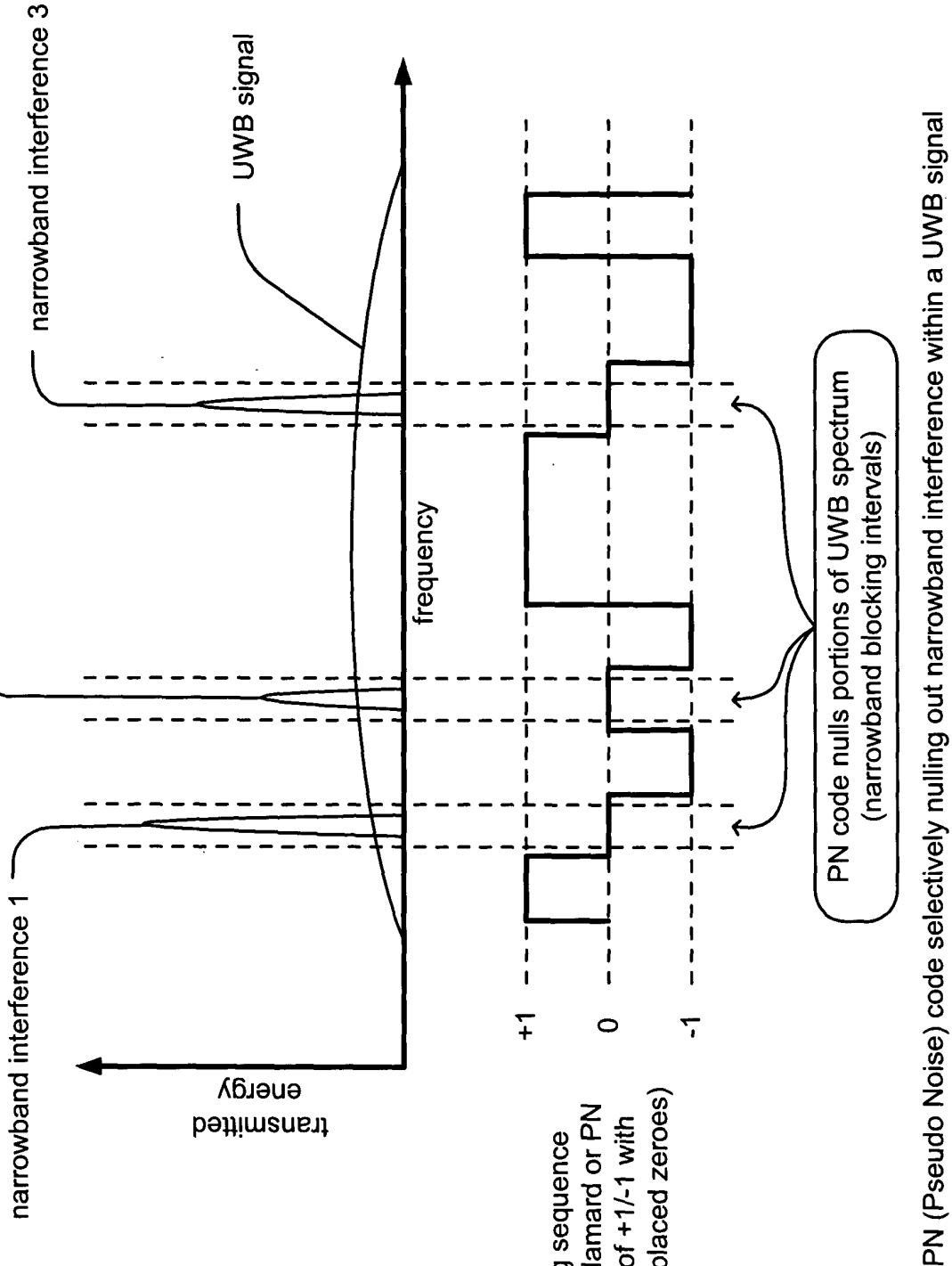
CDMA (Code Division Multiple Access)

Fig. 3



DSSS (Direct Sequence Spread Spectrum)

Fig. 4



PN (Pseudo Noise) code selectively nulling out narrowband interference within a UWB signal

Fig. 5

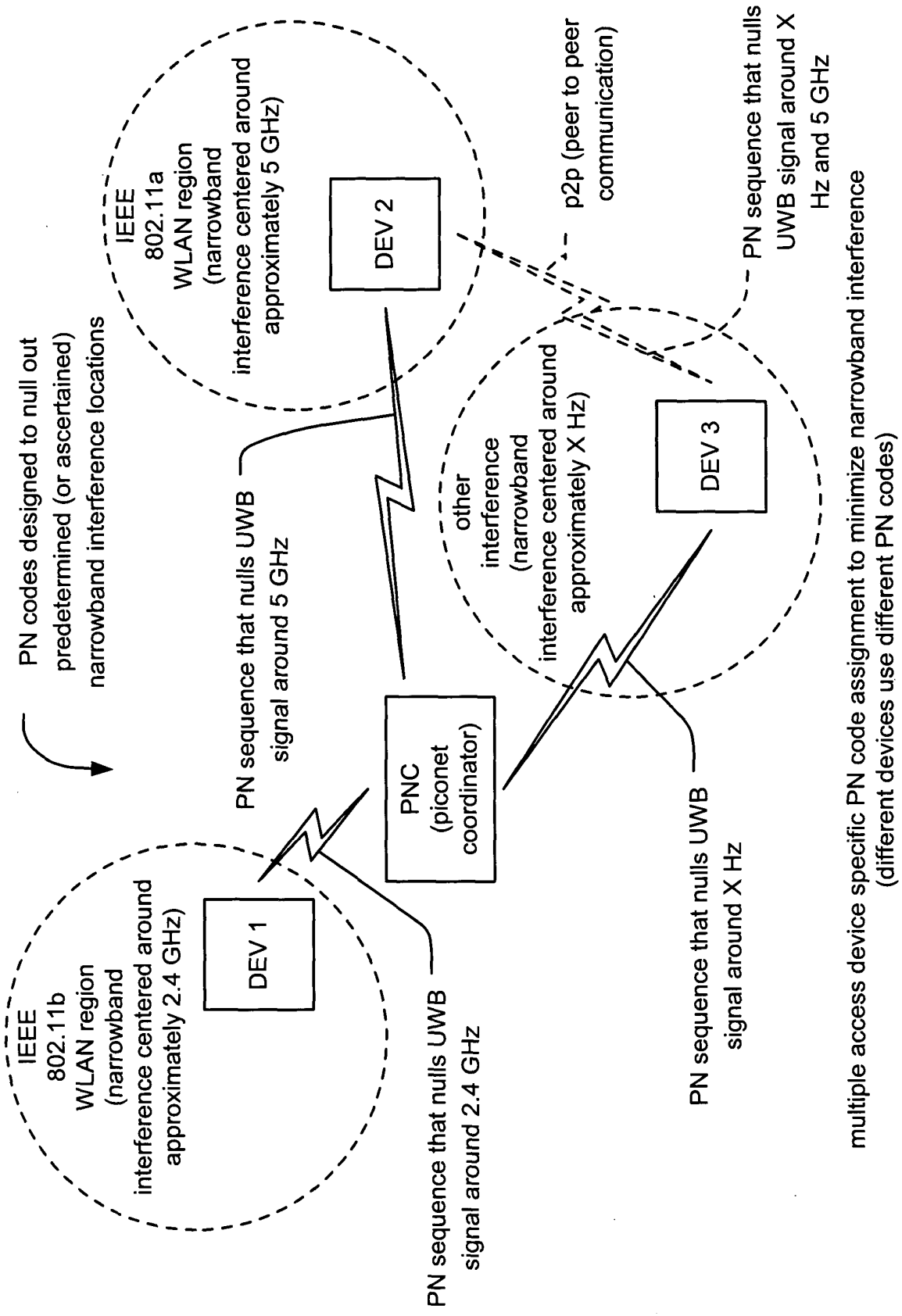

PN codes designed to null out predetermined (or ascertained) narrowband interference locations
IEEE 802.11a WLAN region (narrowband interference centered around approximately 5 GHz)
IEEE 802.11b WLAN region (narrowband interference centered around approximately 2.4 GHz)
other interference (narrowband interference centered around approximately X Hz)
DEV 1
DEV 2
DEV 3
PNC (piconet coordinator)
PN sequence that nulls UWB signal around 5 GHz
PN sequence that nulls UWB signal around 2.4 GHz
PN sequence that nulls UWB signal around X Hz
PN sequence that nulls UWB signal around X Hz and 5 GHz
p2p (peer to peer communication)
multiple access device specific PN code assignment to minimize narrowband interference
(different devices use different PN codes)

Fig. 6

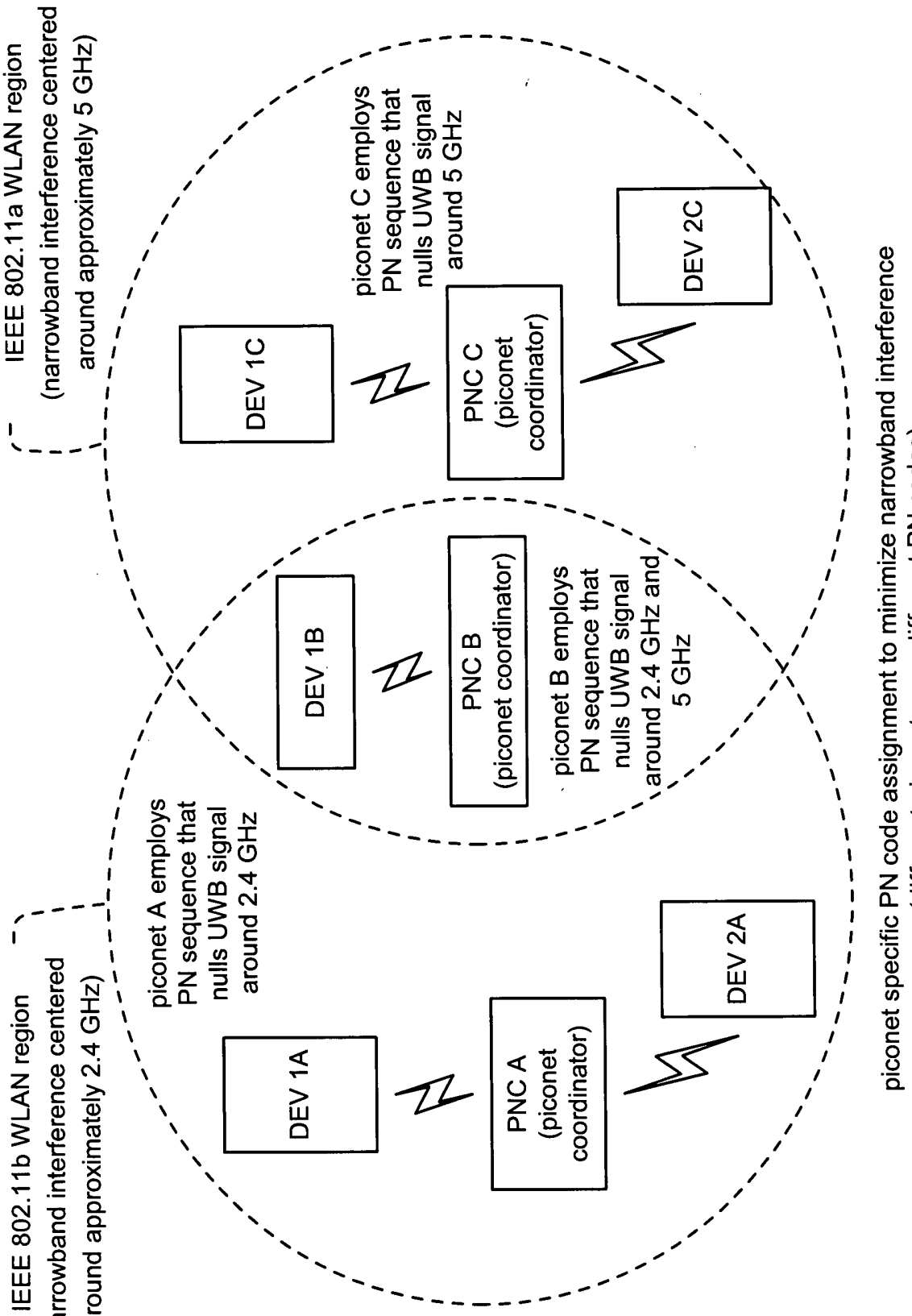
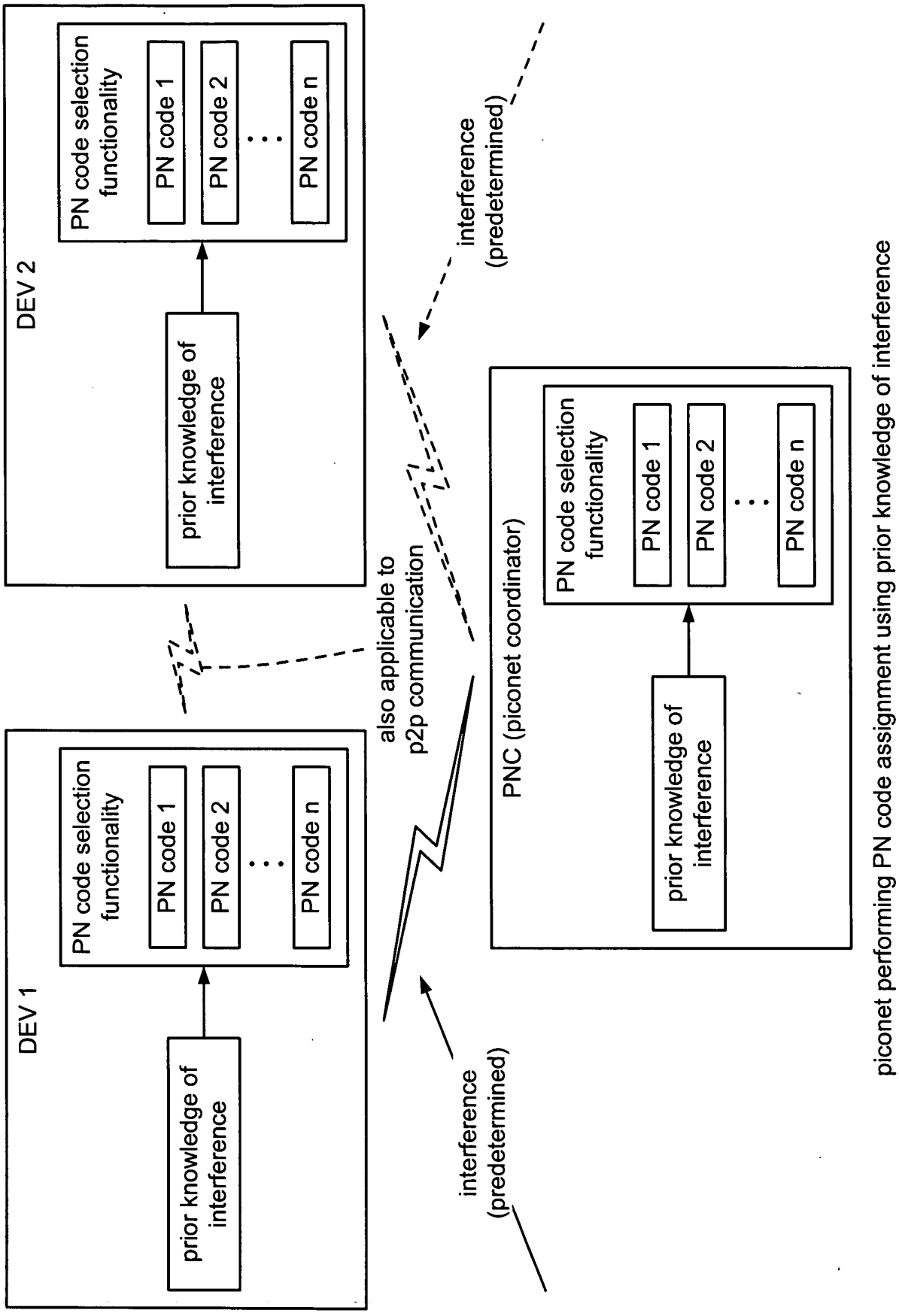
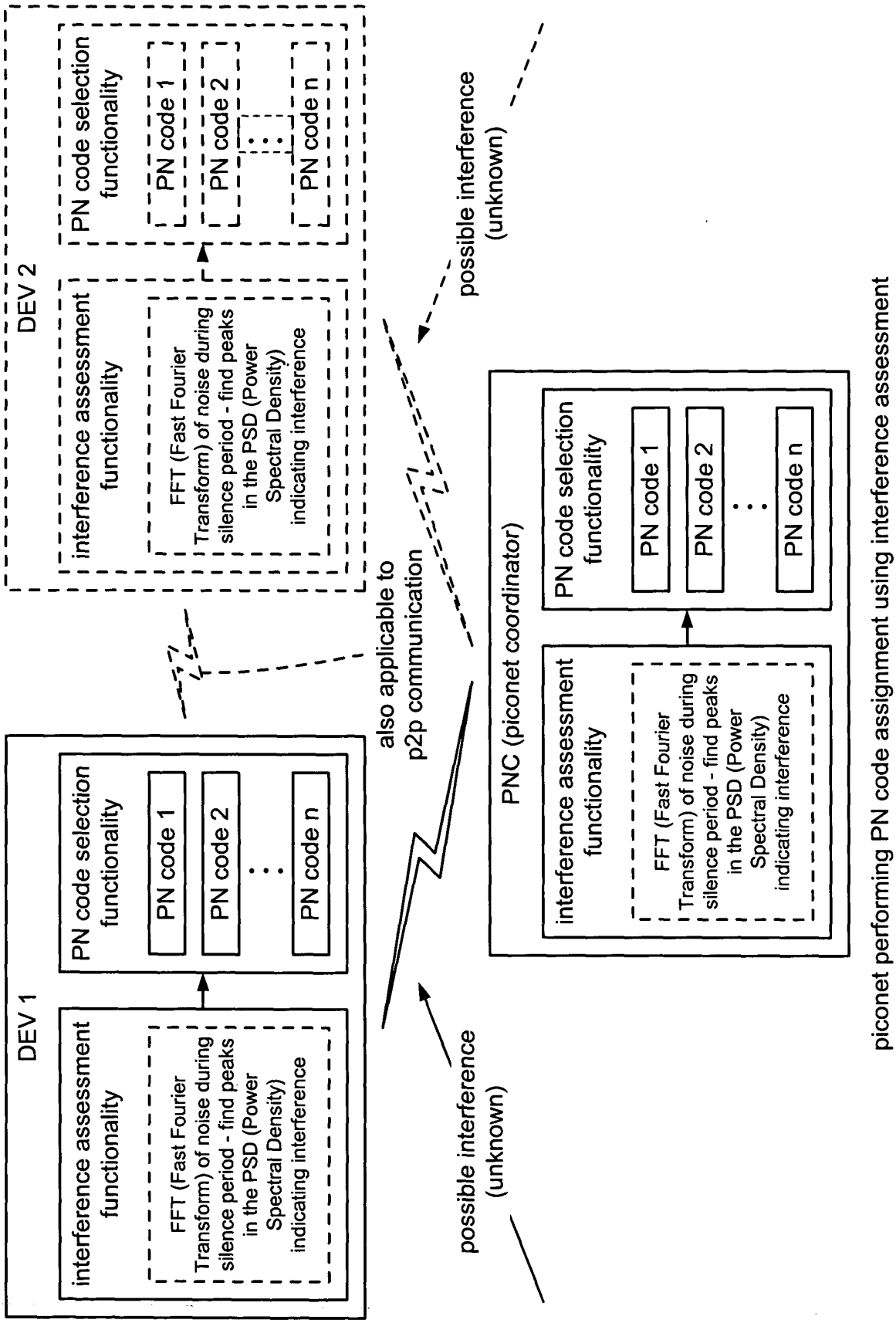

IEEE 802.11a WLAN region
(narrowband interference centered
around approximately 5 GHz)
piconet C employs
PN sequence that
nulls UWB signal
around 5 GHz
DEV 1C
PNC C
(piconet
coordinator)
DEV 2C
IEEE 802.11b WLAN region
(narrowband interference centered
around approximately 2.4 GHz)
piconet A employs
PN sequence that
nulls UWB signal
around 2.4 GHz
piconet B employs
PN sequence that
nulls UWB signal
around 2.4 GHz and
5 GHz
DEV 1B
PNC B
(piconet coordinator)
DEV 1A
PNC A
(piconet
coordinator)
DEV 2A
piconet specific PN code assignment to minimize narrowband interference
(different piconets use different PN codes)

Fig. 7



piconet performing PN code assignment using prior knowledge of interference

Fig. 8



piconet performing PN code assignment using interference assessment

Fig. 9

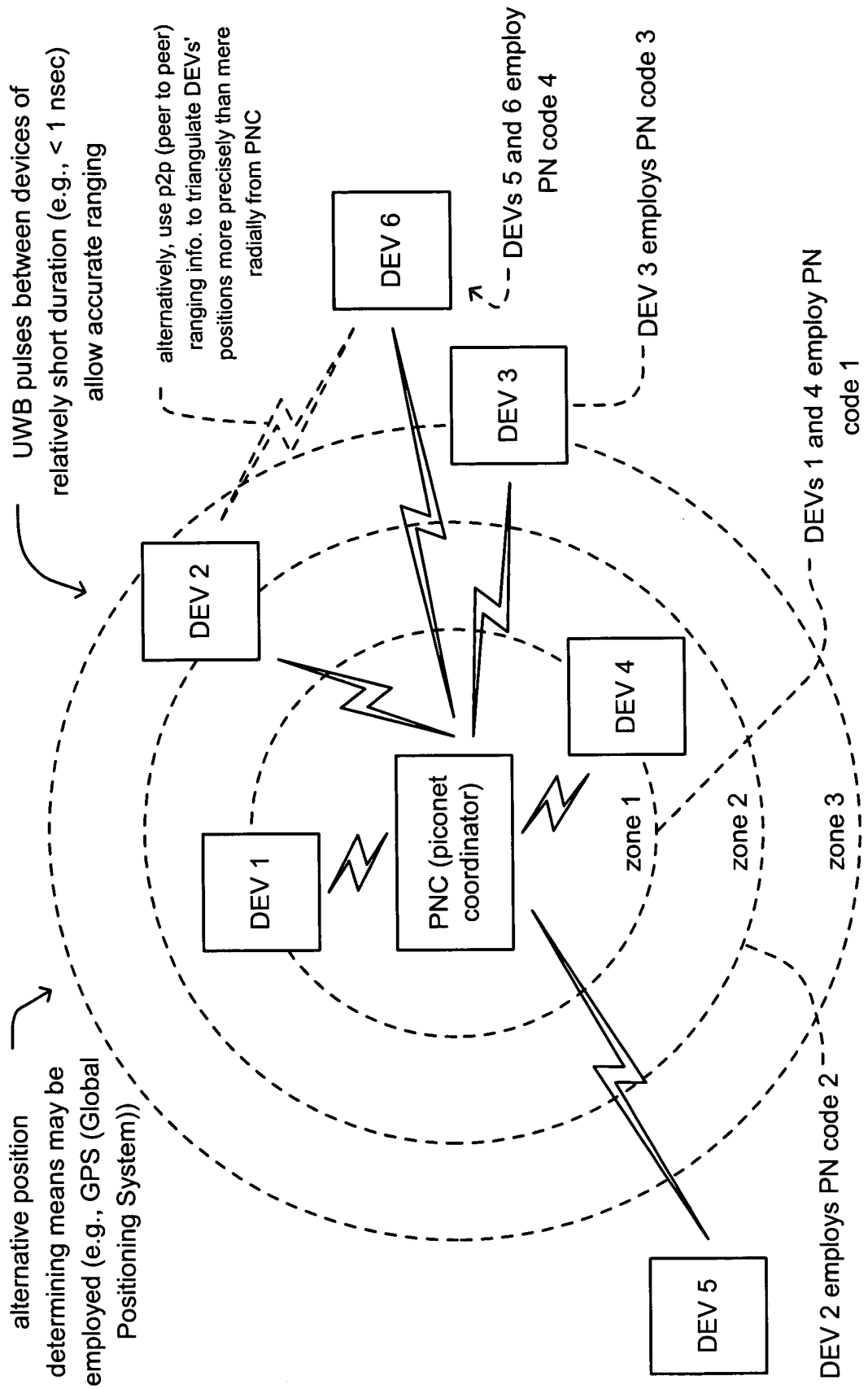
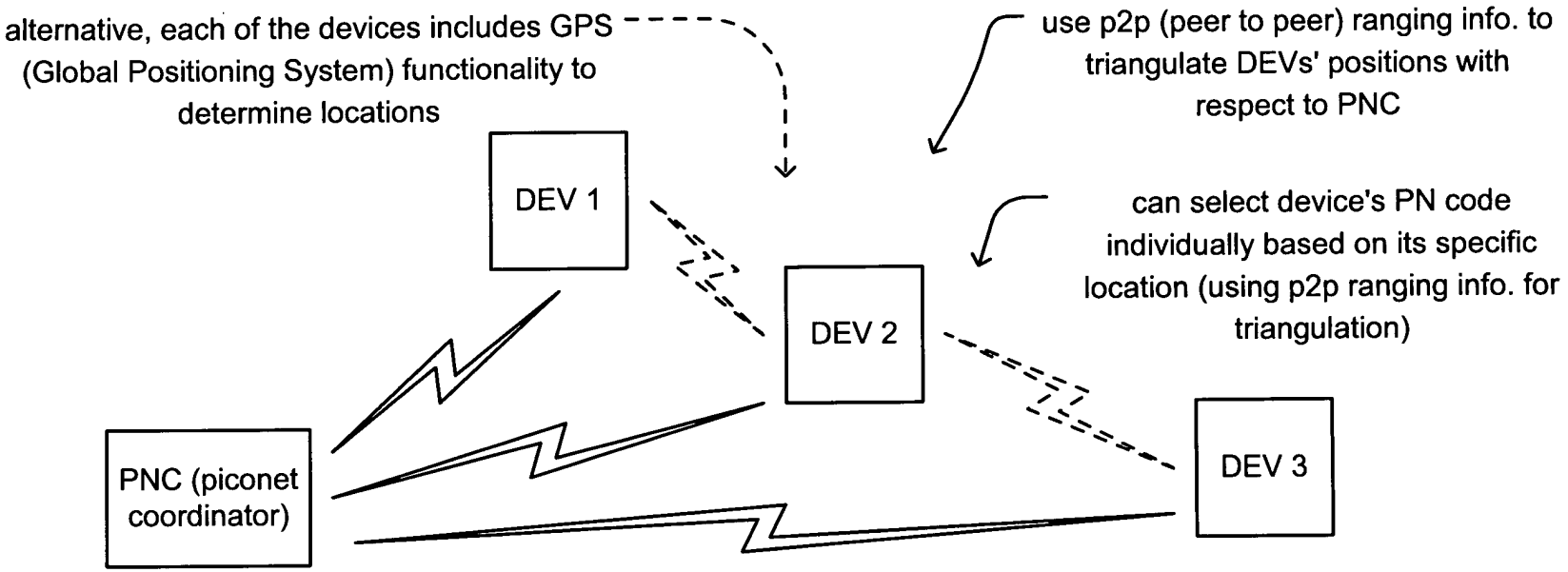


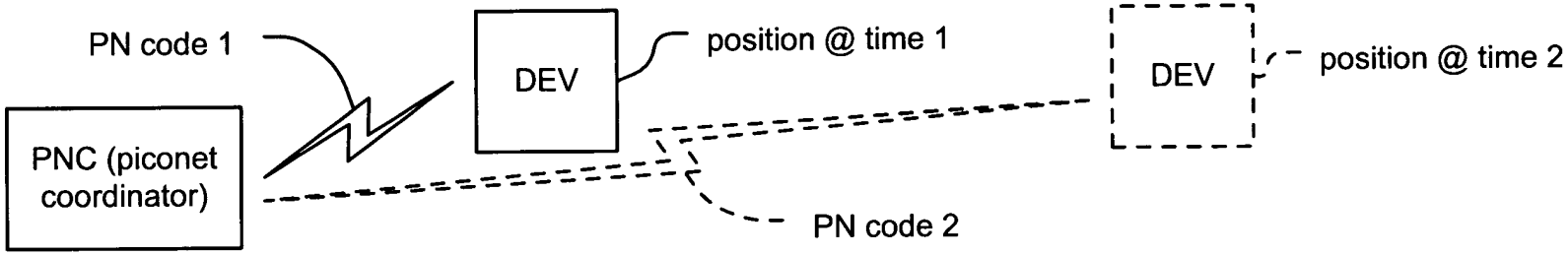
Fig. 10

position determination of devices in a piconet (shown in a radial embodiment)



position determination of devices in a piconet (shown using triangulation)

Fig. 11A



position determination of devices in a piconet (shown accommodating changes in positions)

Fig. 11B

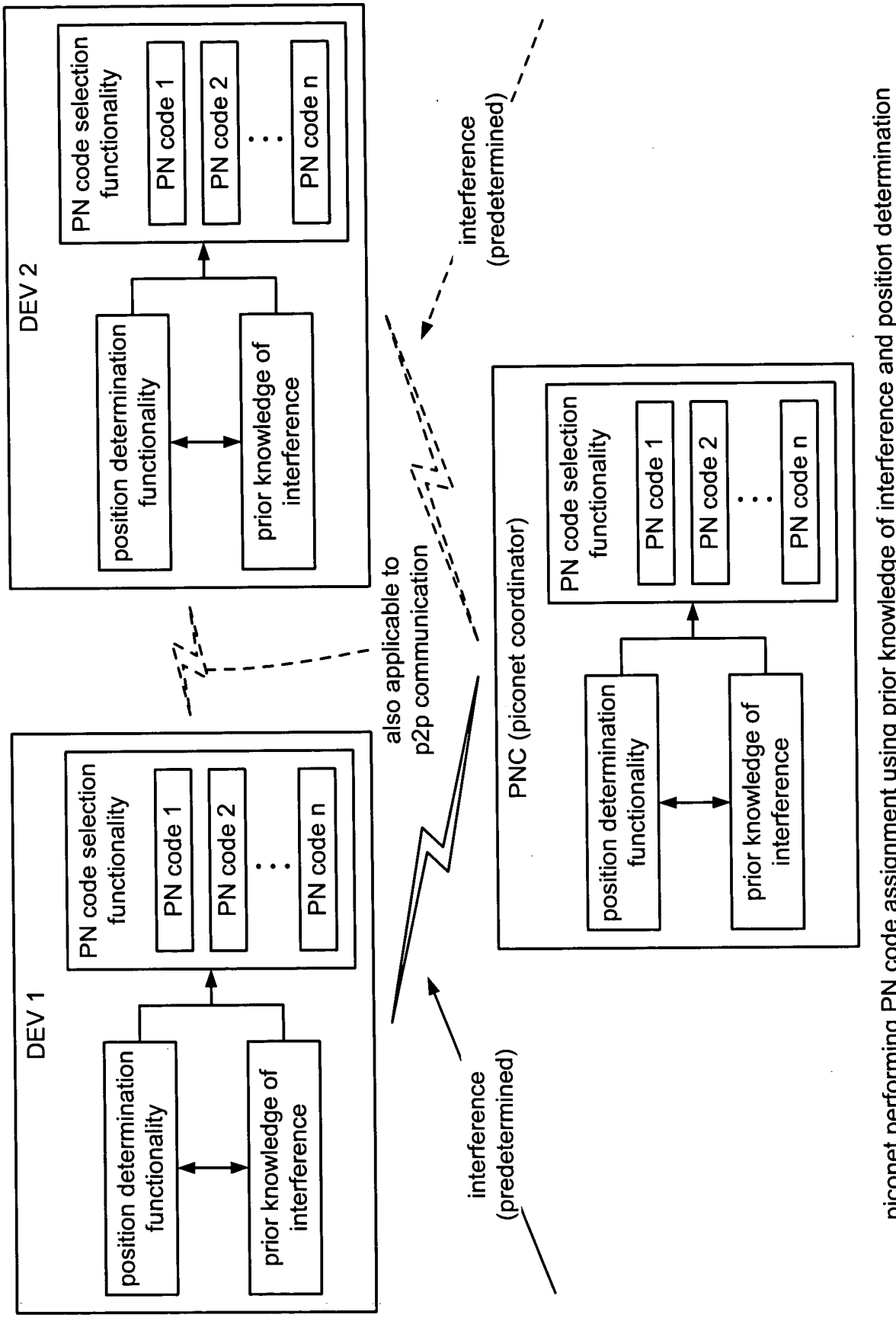
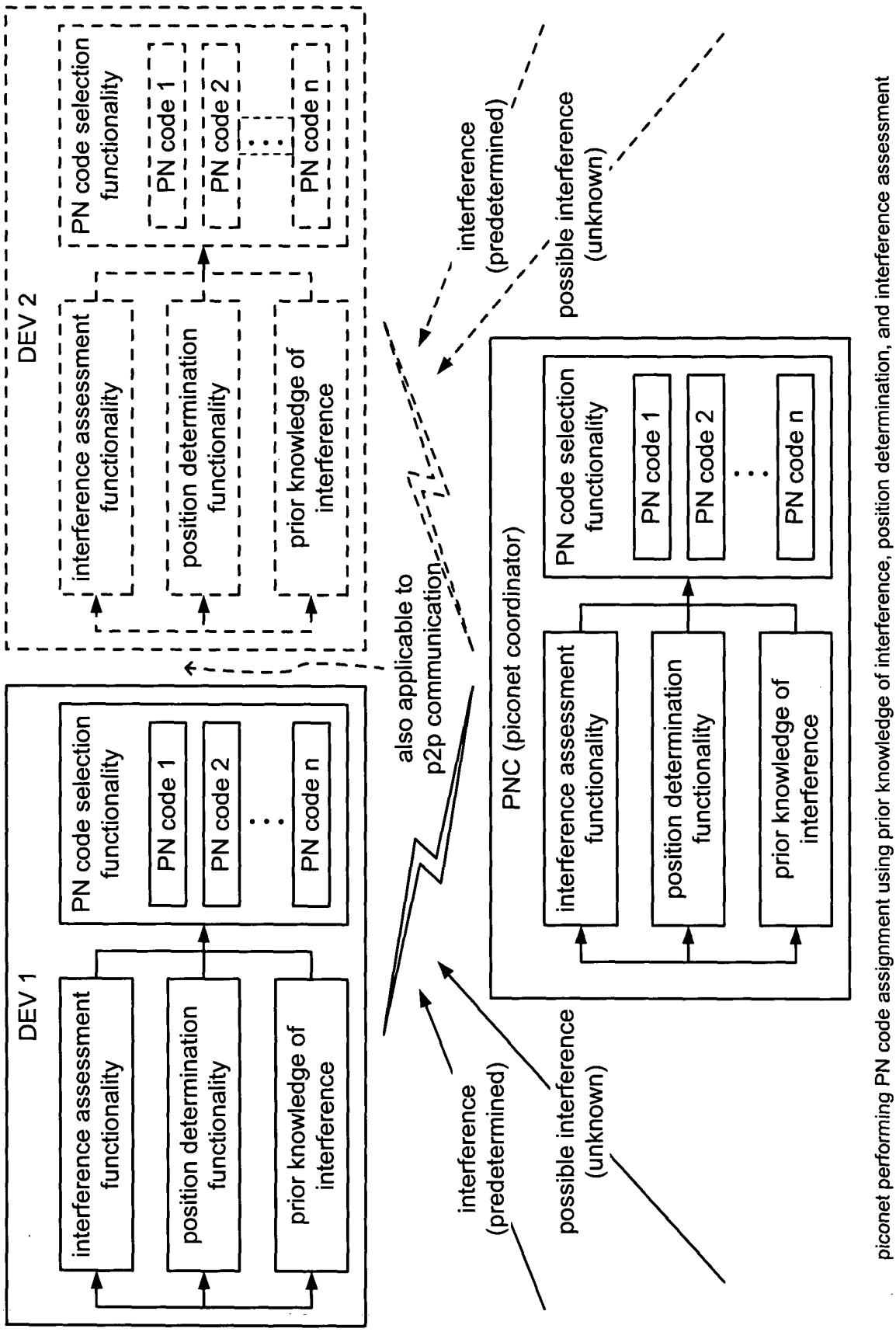


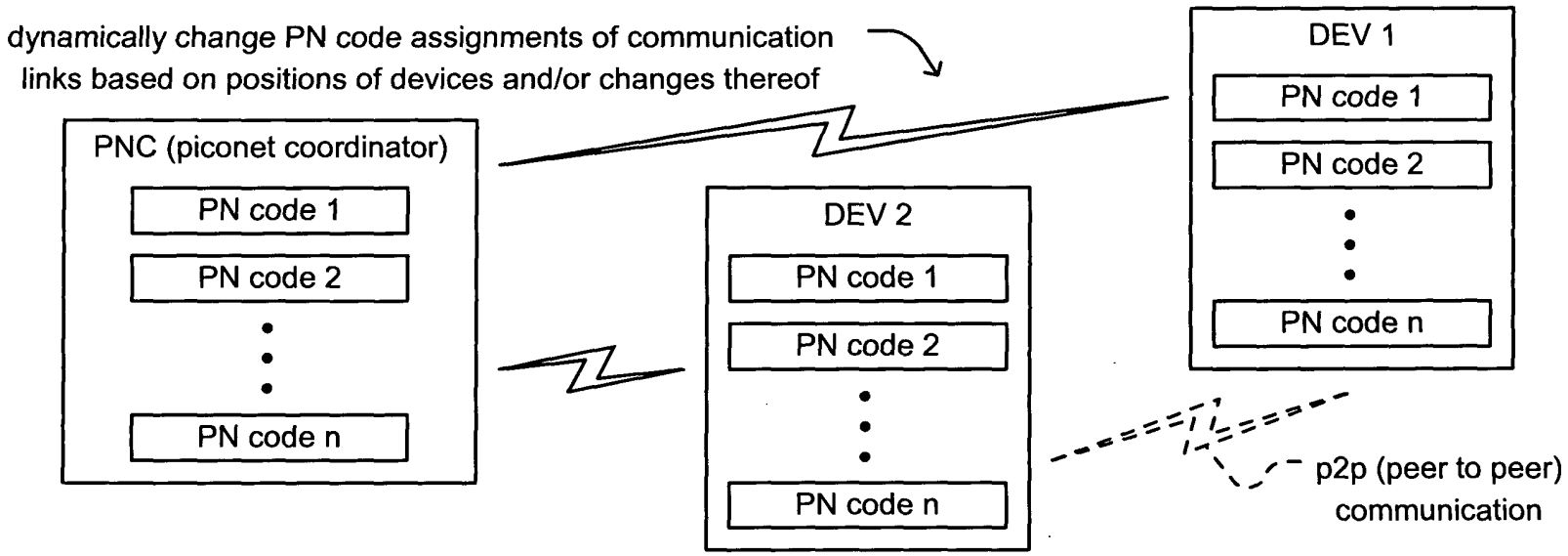
Fig. 12

piconet performing PN code assignment using prior knowledge of interference and position determination



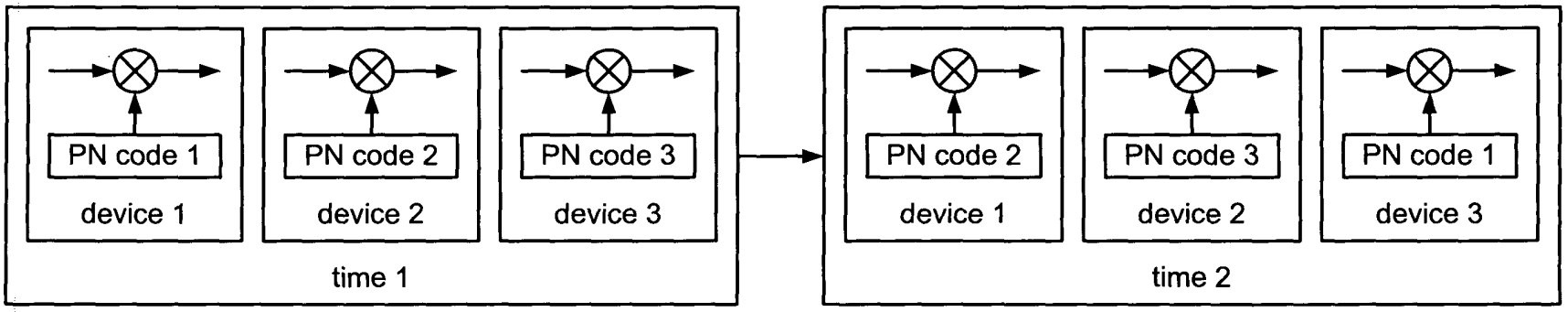
piconet performing PN code assignment using prior knowledge of interference, position determination, and interference assessment

Fig. 13



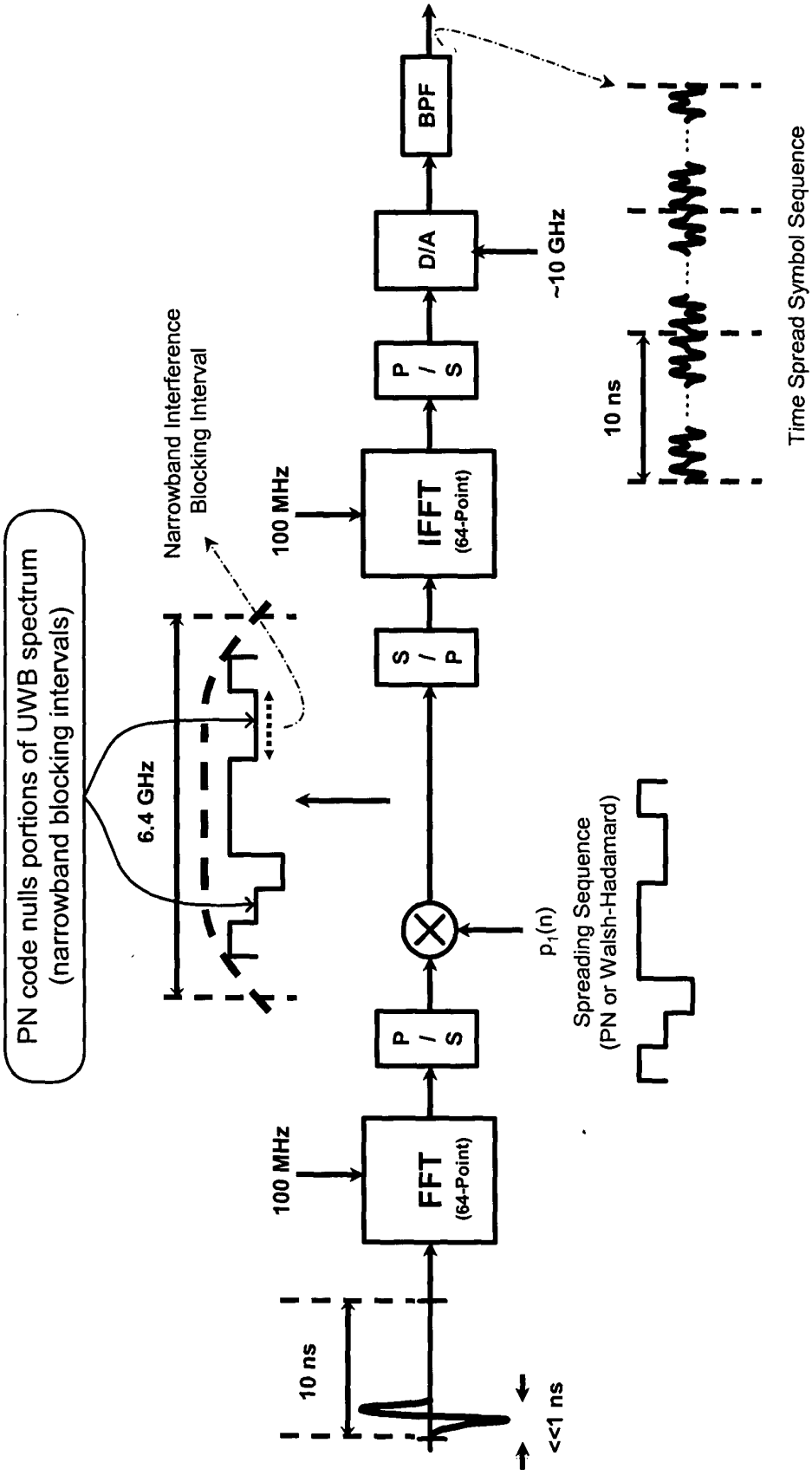
dynamic re-assignment of PN codes within piconet (using finite set of PN codes stored within devices)

Fig. 14A



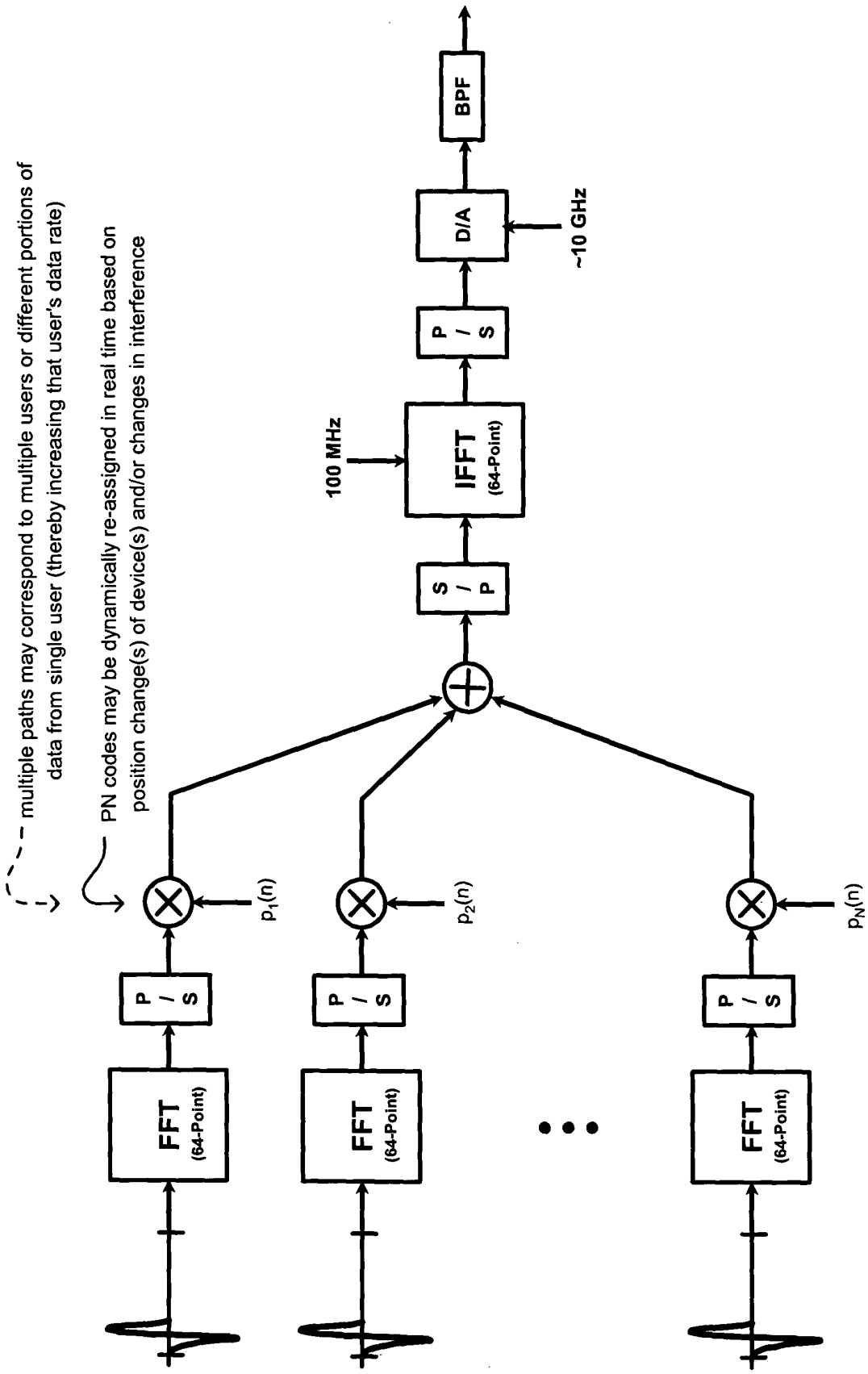
dynamic re-assignment of PN codes for multiple devices as a function of time

Fig. 14B



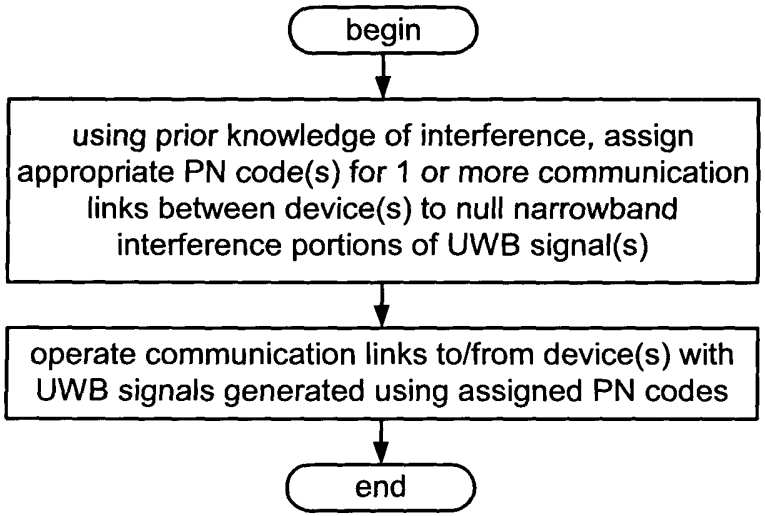
UWB (Ultra Wide Band) waveform design using DSSS (Direct Sequence Spread Spectrum)

Fig. 15



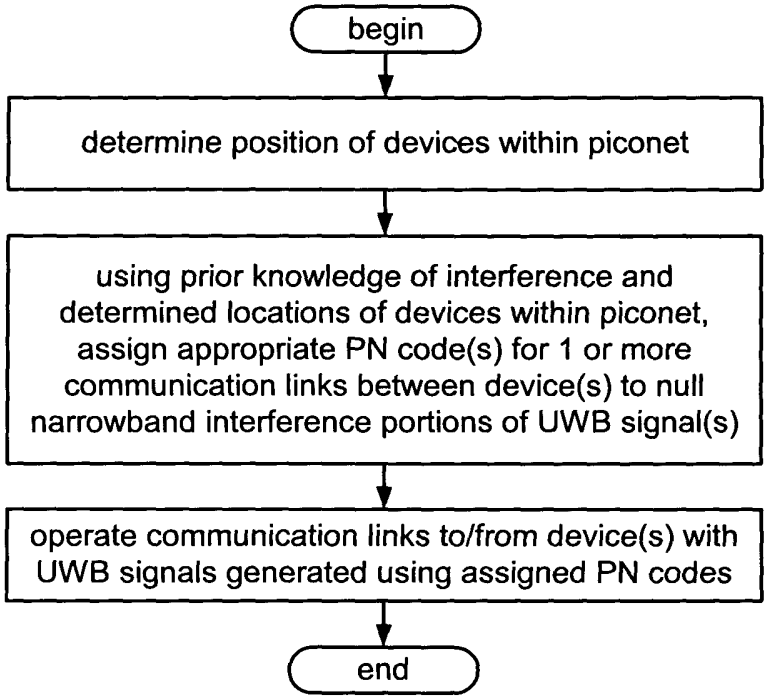
UWB (Ultra Wide Band) waveform design using CDMA (Code Division Multiple Access)

Fig. 16



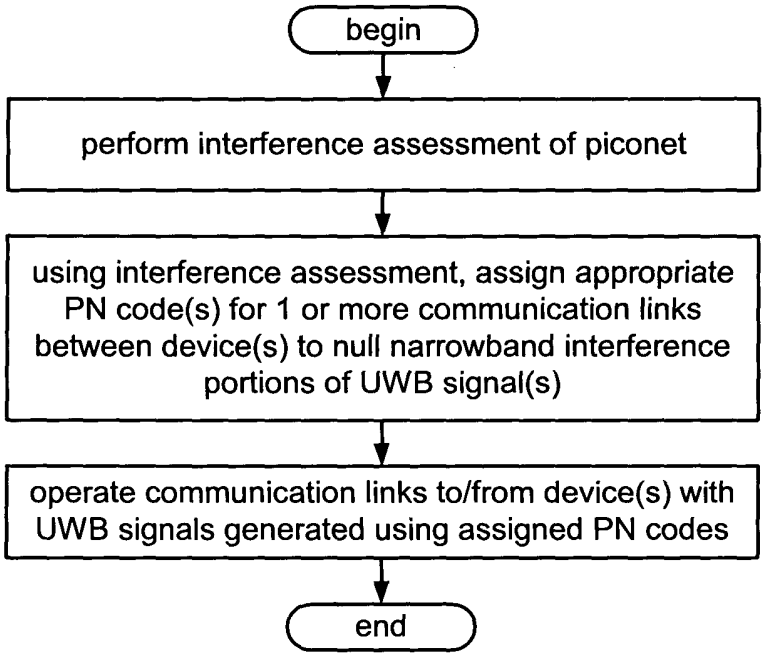
piconet operating method

Fig. 17A



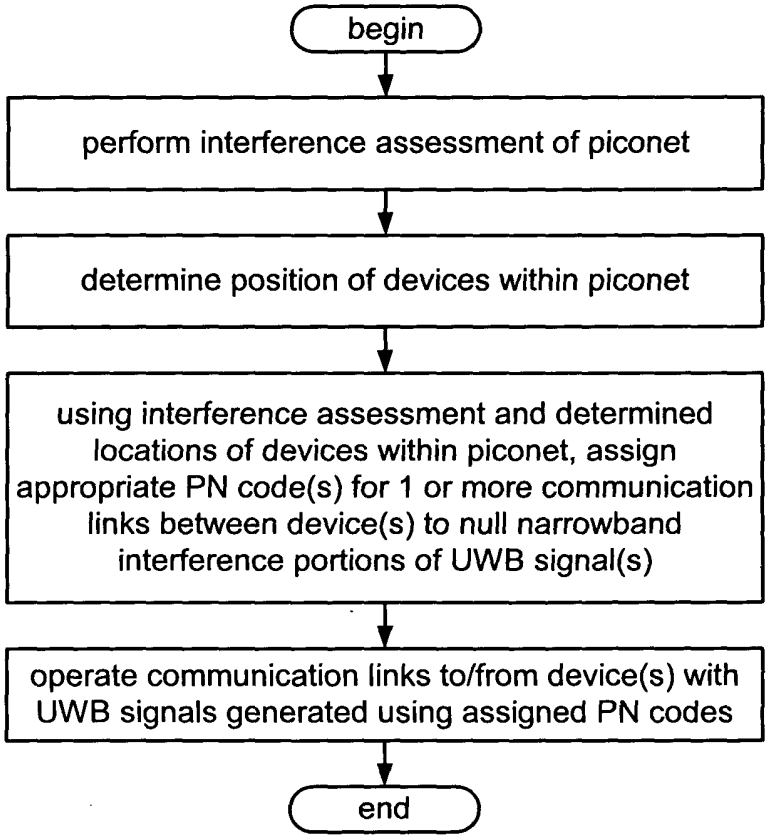
piconet operating method

Fig. 17B



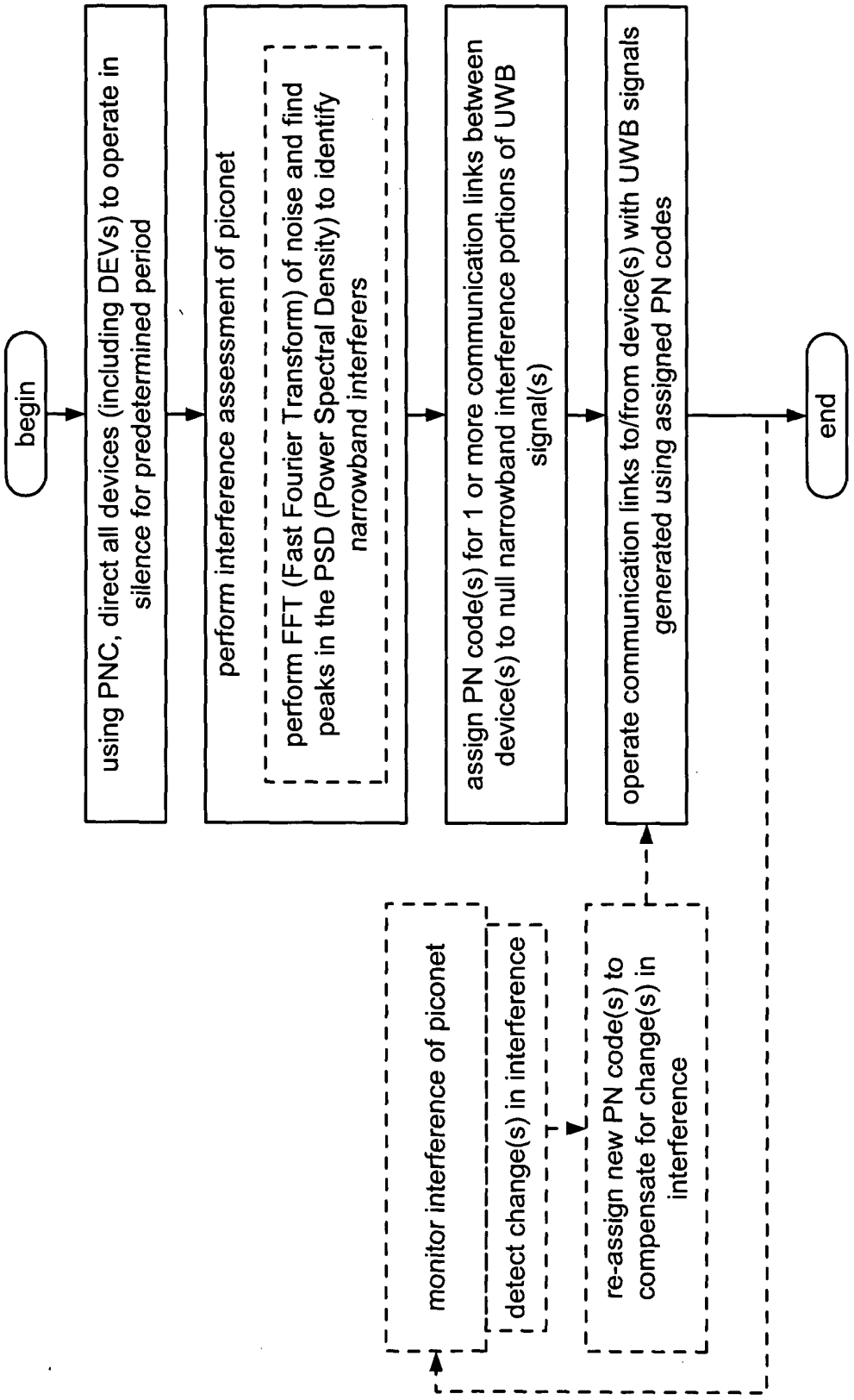
piconet operating method

Fig. 18A



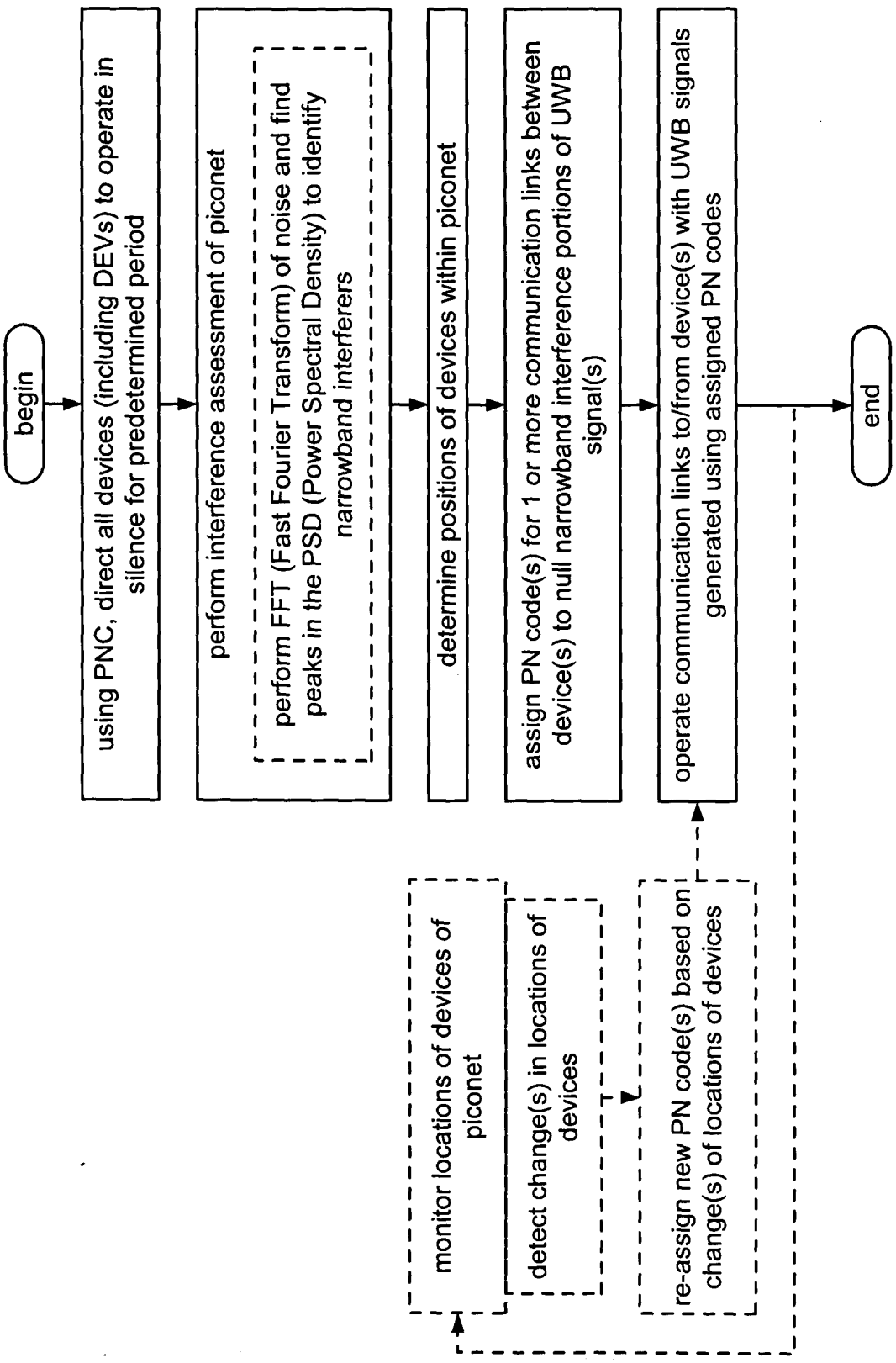
piconet operating method

Fig. 18B



piconet operating method

Fig. 19



piconet operating method

Fig. 20